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Yu et al.

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(54) **HEAT SINK CLIP**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 532 days.

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(30) **Foreign Application Priority Data**

Dec. 15, 2005 (CN) 2005 1 0120710

(51) **Int. Cl.**
H05K 7/20 (2006.01)

(52) **U.S. Cl.** **165/80.3**; 165/80.2; 361/704; 24/455; 24/458

(58) **Field of Classification Search** 165/80.3, 165/185; 361/704, 710
See application file for complete search history.

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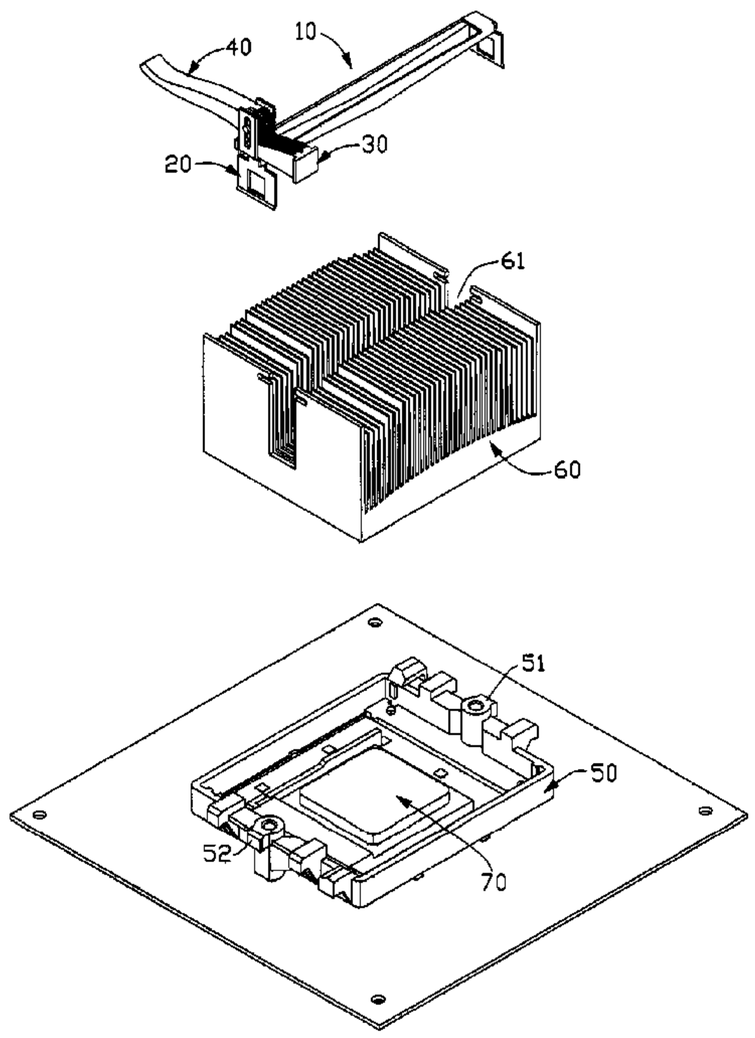
(57) **ABSTRACT**

A heat sink clip for securing a heat sink to a heat generating electronic component includes a spring member including an elongated main body. A connecting portion is formed at one end of the main body and a first locking leg extends from the other end thereof. A second locking leg is coupled to the connecting portion of the spring member. An actuating member connects pivotally with the second locking leg. An assisting member, which is located between the actuating member and the connecting portion, includes a wedged main body. When the actuating member is rotated from a first orientation to a second orientation, the assisting member horizontally moves a distance thereby moving the actuating member to a raised level. The actuating member has teeth engaging with teeth formed on an inclined face of the wedged main body.

19 Claims, 6 Drawing Sheets



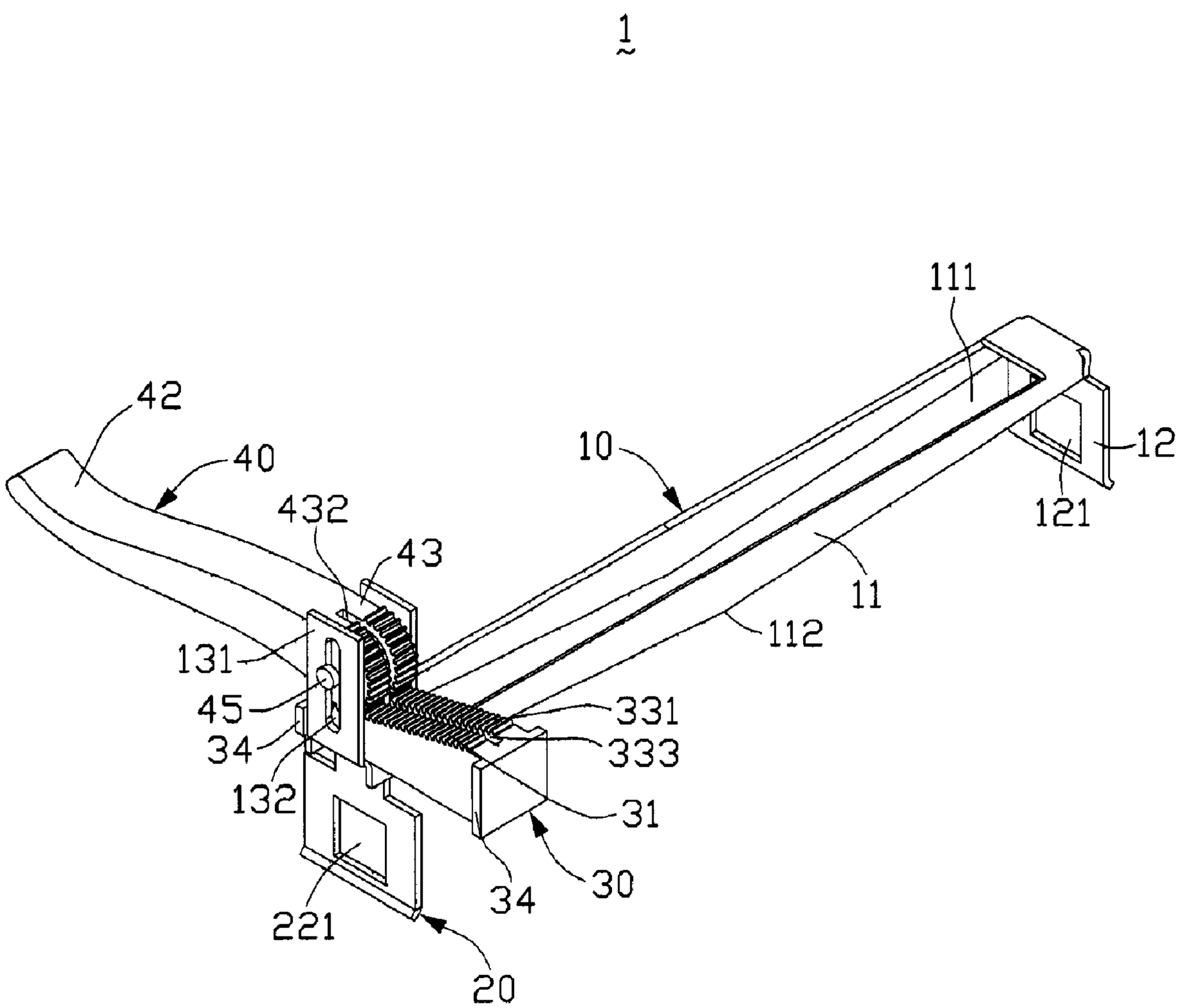

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FIG. 1

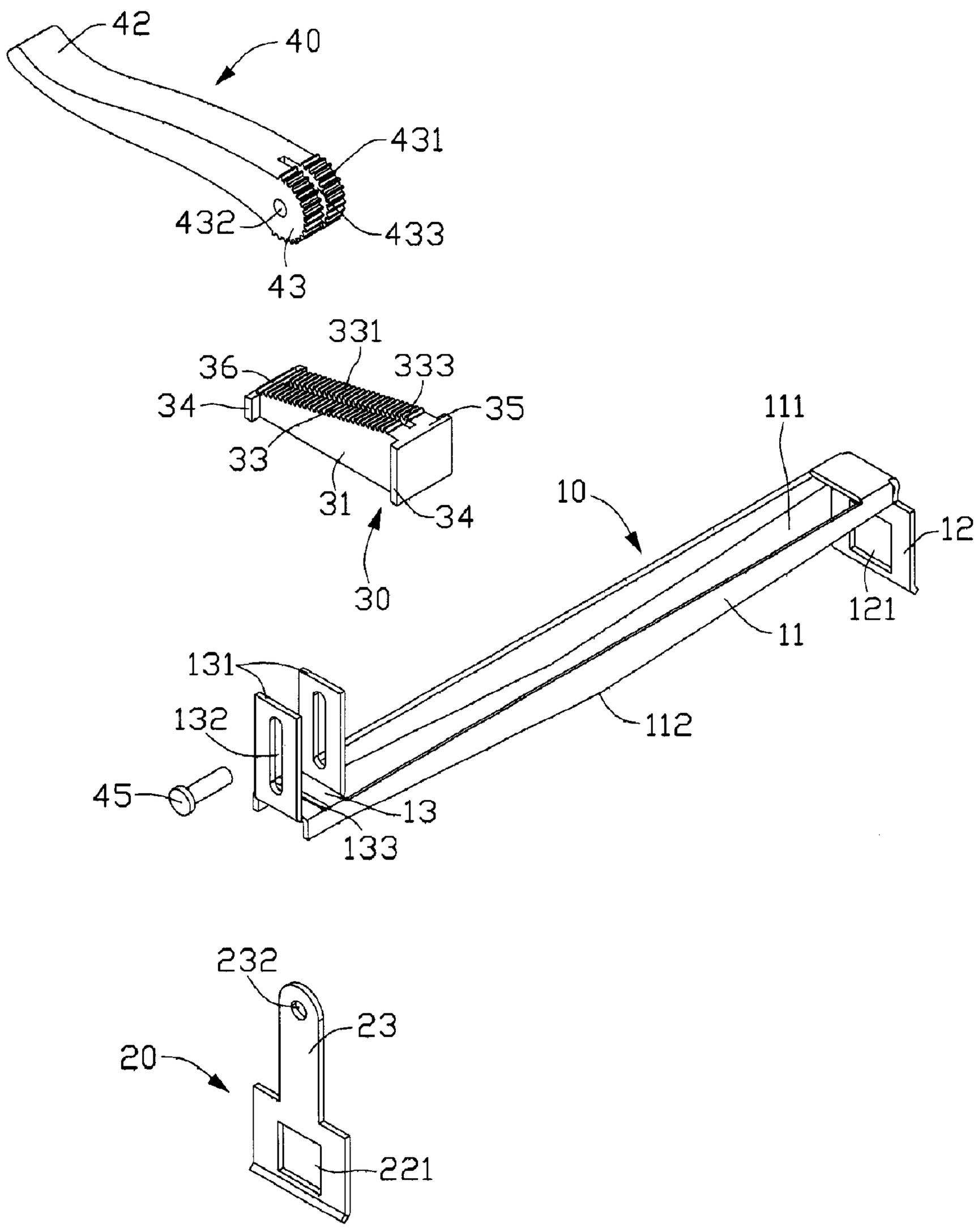
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FIG. 2

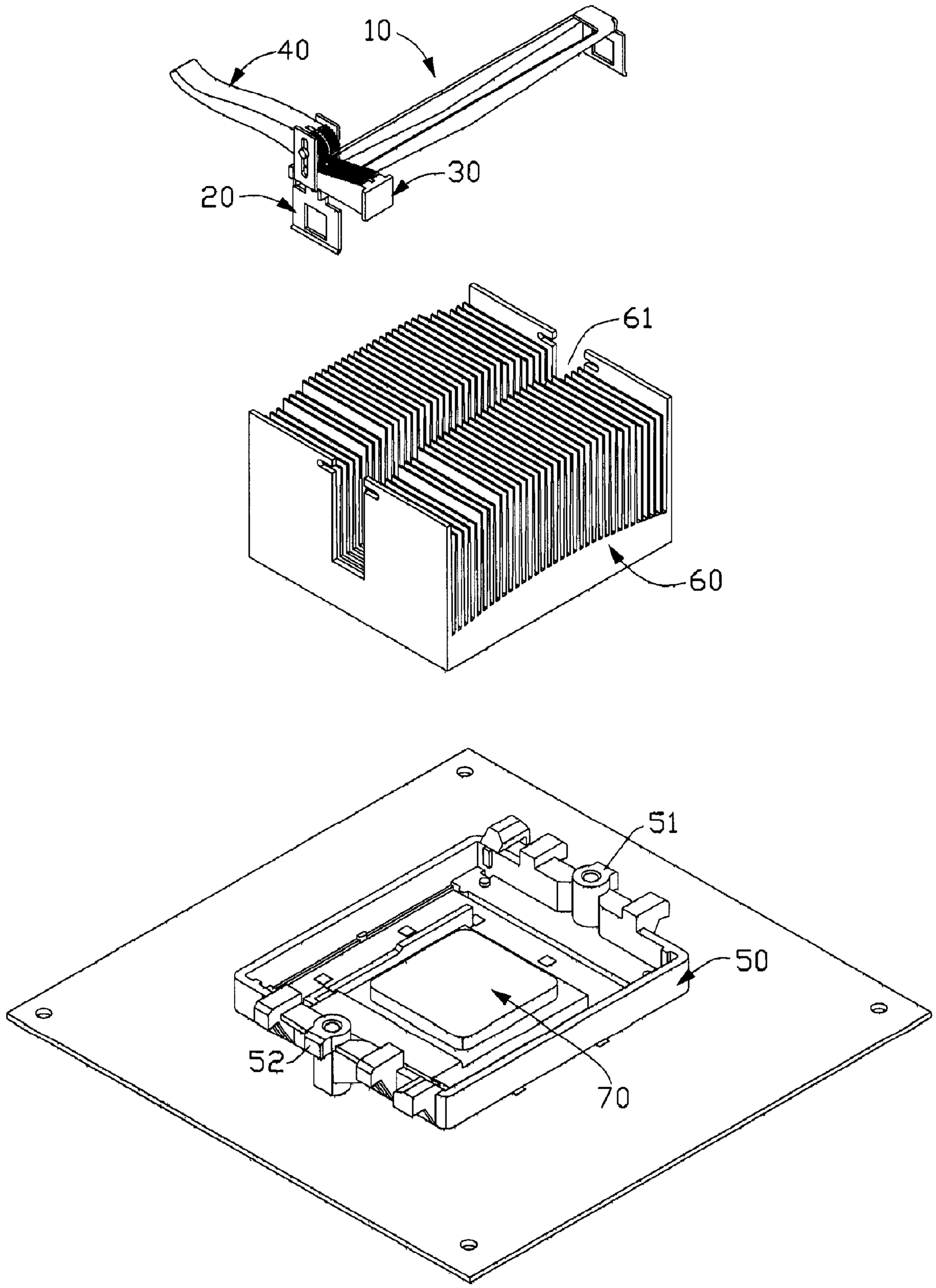


FIG. 3

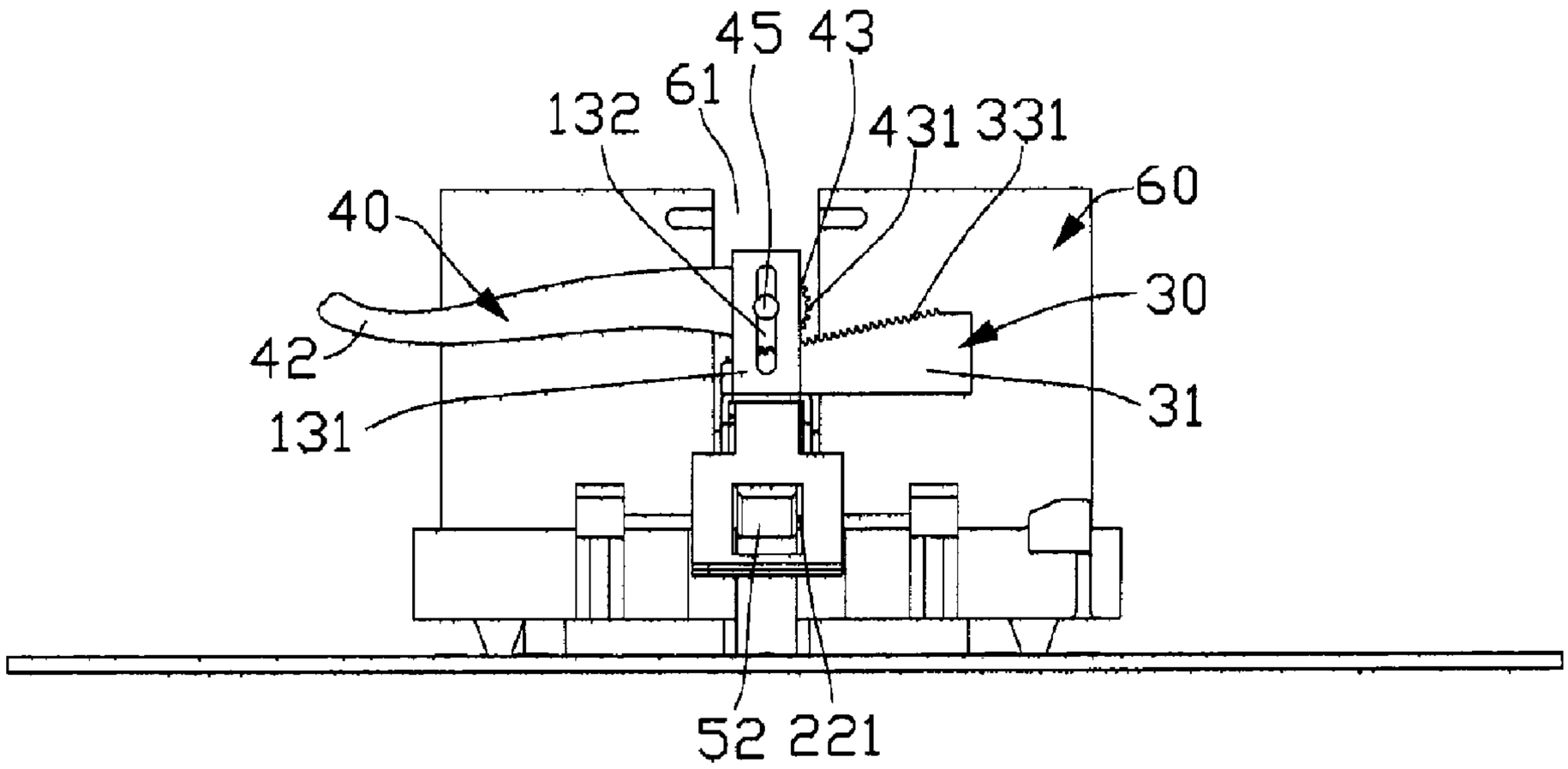


FIG. 4

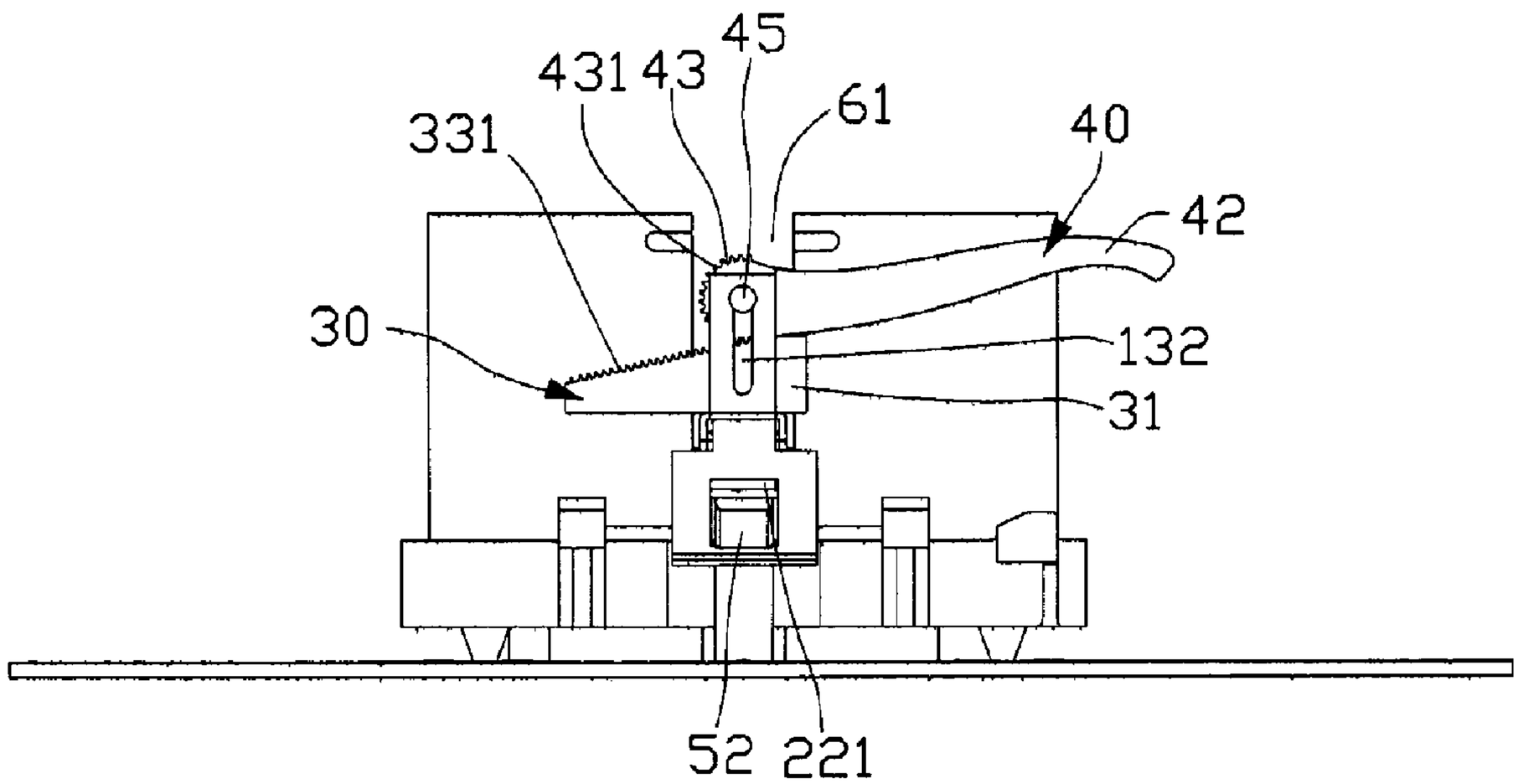


FIG. 5

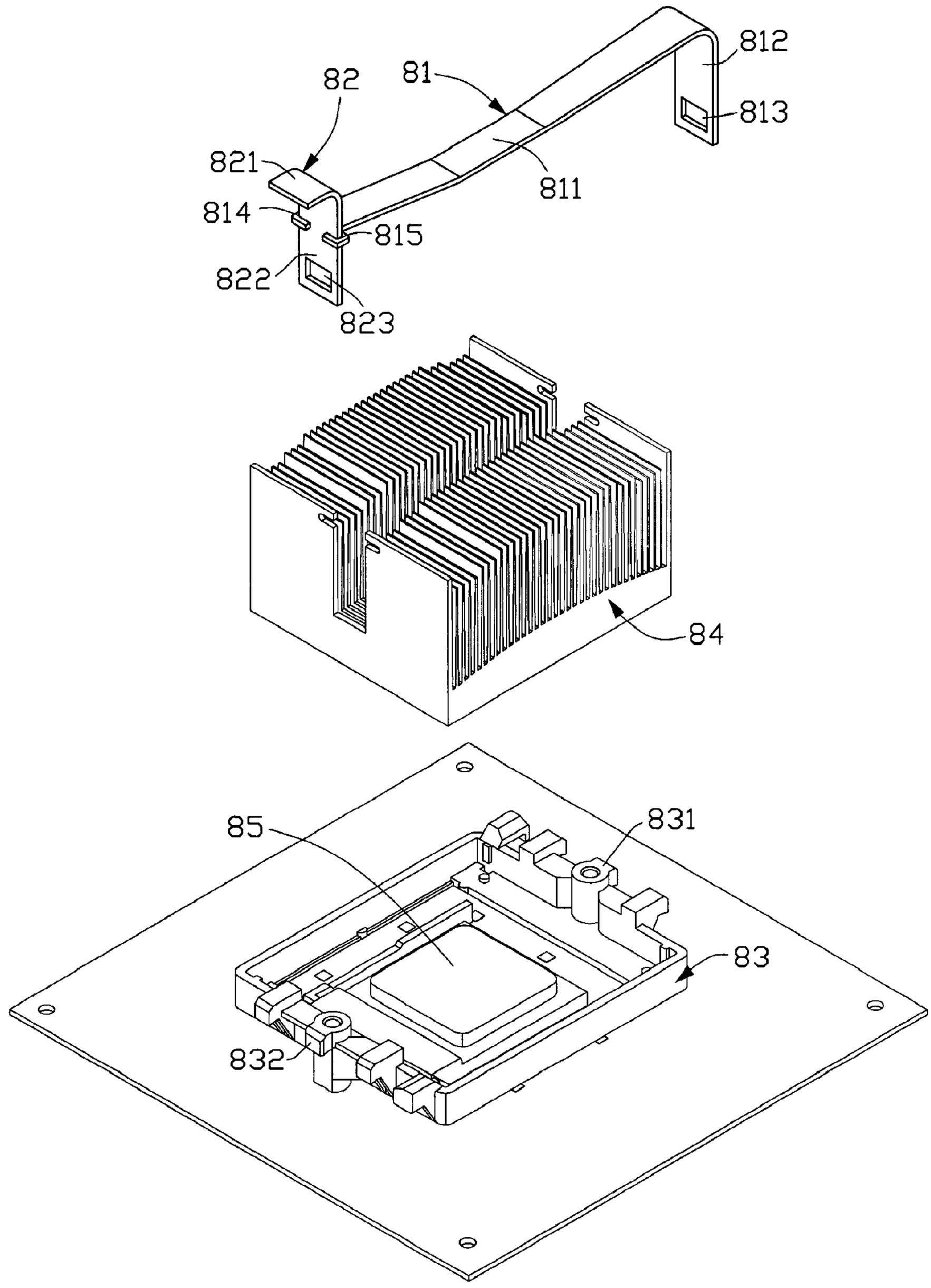


FIG. 6
(RELATED ART)

HEAT SINK CLIP

FIELD OF THE INVENTION

The present invention relates generally to clips, and more particularly to a clip which secures a heat sink to a heat generating electronic component easily and conveniently.

DESCRIPTION OF RELATED ART

CPU (central processing unit) is the computing and control unit of a computer for interpreting and executing all kinds of instructions. By means of the definition, the CPU functions as the "brain" of the computer. With fast development in computer technology, advanced CPUs are made to have relatively smaller size but relatively faster operational speed. During operation of such an advanced CPU, a large amount of heat is generated. In order to dissipate the heat from the CPU, a heat sink or other cooling device is used. Oftentimes, the heat sink is secured to the CPU by a clip.

Referring to FIG. **6**, a heat sink clip in accordance with related art includes a first member **81** and a second member **82** coupled to the first member **81**. The clip secures a heat sink **84** to a retention frame **83** which surrounds a CPU **85** supported on a circuit board (not labeled). The retention frame **83** has first and second catches **831**, **832** at opposite sides thereof. The first member **81** of the clip includes a spring portion **811** and a first leg **812** extending downwardly from an end of the spring portion **811**. The leg **812** defines a first hole **813** for engaging with the first catch **831** of the retention frame **83**. A pair of fingers **814** extends from the other end of the spring portion **811** to define a receiving slot **815** for receiving and holding the second member **82** therein. The second member **82**, which is L-shaped, includes a pressing portion **821** located above the spring portion **811** of the first member **81** for manual operations, and a second leg **822** defining a second hole **823** for engaging with the second catch **832** of the retention frame **83**. The spring portion **811** deforms to generate a spring force against the heat sink **84** for securing the heat sink **84** to the CPU **85** when the clip is mounted to the retention frame **83**.

In order to fix the heat sink **84** to the CPU **85**, a large force is required to operate the pressing portion **821**. Furthermore, it is difficult to manipulate the pressing portion **821** to engage the second hole **823** with the second catch **832**.

Therefore, it is desirable to provide a heat sink clip which can overcome the above-mentioned disadvantages.

SUMMARY OF THE INVENTION

The present invention relates to a heat sink clip for attaching a heat sink to a heat generating electronic component. The heat sink clip includes a spring member including an elongated main body. A connecting portion connects at one end of the main body and a first locking leg extends from the other end thereof. A second locking leg is coupled to the connecting portion of the spring member. An actuating member connects pivotally with the second locking leg. An assisting member, which is located between the actuating member and the connecting portion, includes a wedged main body operatively engaged with the actuating member. When the actuating member is rotated from a first orientation to a second orientation, the actuating member is raised by the assisting member, whereby the second locking log is lifted to have a tight engagement with retention member.

Other advantages and novel features of the present invention will become more apparent from the following detailed

description of preferred embodiment when taken in conjunction with the accompanying drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

Many aspects of the present heat sink clip can be better understood with reference to the following drawings. The components in the drawings are not necessarily drawn to scale, the emphasis instead being placed upon clearly illustrating the principles of the present heat sink clip. Moreover, in the drawings, like reference numerals designate corresponding parts throughout the several views.

FIG. **1** is an assembled, isometric view of a heat sink clip in accordance with a preferred embodiment of the present invention;

FIG. **2** is an exploded, isometric view of the heat sink clip of FIG. **1**;

FIG. **3** is an exploded, isometric view of a heat dissipation assembly incorporating the heat sink clip of FIG. **1**;

FIG. **4** is an assembled, side view of the heat dissipation assembly of FIG. **3**, showing the heat sink clip being in an unlocked position;

FIG. **5** is similar to FIG. **4**, but shows the heat sink clip in a locked position; and

FIG. **6** is an exploded, isometric view of a heat dissipation assembly in accordance with related art.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIGS. **1-2**, a heat sink clip **1** in accordance with a preferred embodiment of the present invention is shown. The heat sink clip **1** includes a spring member **10** having a first locking leg **12** thereon, a second locking leg **20**, an assisting member **30** and an actuating member **40**.

The spring member **10** is typically made of resilient metal material such as stainless steel and includes an elongated main body **11** defining an elongated cutout **111** therein for saving the material. The main body **11** has a V-shaped pressing portion **112** at a middle thereof. The first locking leg **12** extends downwardly from a first end of the pressing portion **112** in a direction perpendicular to the main body **11** and defines a first mounting hole **121** near a bottom thereof. A connecting portion **13**, through which a first slot **133** is defined therethrough, is formed at the other end of the main body **11**. A pair of connecting plates **131** extend upwardly from the connecting portion **13** and are located at opposite sides of the first slot **133**. Each of the connecting plates **131** has a vertical, elongated slot **132** therein.

The second locking leg **20** is coupled to the connecting portion **13** of the spring member **10** and includes an inverted T-shaped plate **23**. A second mounting hole **221** is defined in a bottom end of the plate **23**. A first through hole **232** is defined in a top end of the plate **23**. The top end of the plate **23** is inserted through the first slot **133** of the connecting portion **13** of the spring member **10** and projects above the connecting portion **13**.

The assisting member **30**, which is typically made of plastic material, has a wedged main body **31** which has a width slightly smaller than the spacing between the connecting plates **131** of the connecting portion **13** for disposing of the main body **31** between the connecting plates **131**. The main body **31** includes a first end portion **35** and a second end portion **36** having a size smaller than that of the first end portion **35**. Thus, an inclined top surface **33** is formed between the first end portion **35** and the second end portion **36**. The inclined top surface **33** is inclined from the second end portion **36** towards the first end portion **35**. A pair of

protrusions **34** extend laterally outwardly from opposite sides of each of the first and second end portions **35**, **36**, so as to prevent the main body **31** from slipping off from the connecting portion **13** of the spring member **10**. A plurality of teeth **331** is formed over the inclined top surface **33**. A second slot **333** is vertically defined through the main body **31** from the first end portion **35** to the second end portion **36** of the main body **31**. The second slot **333** extends through a middle of the teeth **333**.

The actuating member **40** is also made of plastic material, having a handle portion **42** at one end thereof and a round rotating portion **43** at the other end thereof. The rotating portion **43** has a rounded shape and comprises a plurality of teeth **431** arranged on a circumferential surface thereof. The teeth **431** correspond to the teeth **331** of the assisting member **30**. A second through hole **432** is defined through the rotating portion **43**. Also in the rotating portion **43**, a third slot **433** is defined across the second through hole **432**. A diameter of the second through hole **432** is substantially equal to that of the first through hole **232** of the second locking leg **20**. A width of each of the second slot **333** and the third slot **433** is slightly greater than a thickness of the plate **23** of the second locking leg **20**. The third slot **433** extends through a middle of the teeth **431**.

Referring to FIG. **1**, the assisting member **30** is arranged on the connecting portion **13** of the spring member **10**, between the connecting plates **131** wherein the second slot **333** of the assisting member **30** corresponds to the first slot **133** of the connecting portion **13**. The actuating member **40** is then supported on the inclined top surface **33** of the assisting member **30** to ensure that the teeth **431** engage with the teeth **331**. The top end of the plate **23** of the second locking leg **20** passes successively through the first slot **133** of the connecting portion **13** and the second slot **333** of the assisting member **30**, and enters into the third slot **433** of the actuating member **40**. Thereafter, a pin **45** is inserted through the elongated slots **132** of the connecting plates **131**, the second through hole **432** of the actuating member **40** and the first through hole **232** of the second locking leg **20** to thereby pivotally secure the second locking leg **20** and the actuating member **40** to the connecting plates **131** of the spring member **10**. The actuating member **40** is located in a direction substantially perpendicular to the spring member **10** and projects laterally outwardly from the main body **11** of the spring member **10**.

Referring to FIGS. **3-5**, the heat sink clip **1** is illustrated to secure a heat sink **60** to a retention frame **50** surrounding a heat generating electronic component **70** (such as a CPU) supported on a circuit board (not labeled). The heat sink **60** defines a locating groove **61** in a middle portion thereof for accommodating the main body **11** of the spring member **10**. The retention frame **50** defines two first and second catches **51**, **52** at two opposite sides thereof, corresponding to the first and second mounting holes **121**, **221** of the first and second locking legs **12**, **20**, respectively.

In assembly, the main body **11** of the heat sink clip **1** is placed in the locating groove **61** of the heat sink **60**. The first and second mounting holes **121**, **221** of the first and second locking legs **12**, **20** loosely receive the first and second catches **51**, **52** of the retention frame **50**, respectively, as shown in FIG. **4**. Being in a horizontal position, the handle portion **42** of the actuating member **40** is located at a left side of the spring member **11**. As located between the connecting plates **131** of the spring member **10**, the rotating portion **43** of the actuating member **40** engages with the main body **31** of the assisting member **30** near the second end portion **36** (shown in FIG. **2**) thereof, wherein the second end portion **36** is lower than the first end portion **35**. The first end portion **35** (shown in FIG. **2**) of the assisting member **30** is located at a right side of the spring member **10**. At this moment, the heat sink clip **1** is located at an unlocked position.

Then, the handle portion **42** of the actuating member **40** is rotated in a clockwise direction, and the teeth **431** on the rotating portion **43** enter into engagement with the teeth **331** formed on the inclined top surface **33** of the assisting member **30**. As a result, the assisting member **30** moves linearly and horizontally from the right side towards the left side of the spring member **10**. Due to the height difference between the first end portion **36** and the second end portion **35** of the assisting member **30**, the actuating member **40** is pushed to move upwardly along the elongated slots **132** whereby the second locking leg **20** is driven to move upwardly in a direction perpendicular to the retention frame **50** to motivate the heat sink clip **1** to firmly engage with the retention frame **50**. At this stage, the heat sink clip is located at a locked position, as shown in FIG. **5**. The handle portion **42** of the actuating member **40** is located horizontally at the right side of the spring member **11**. The rotating portion **43** of the actuating member **40** engages with the main body **31** of the assisting member **30** near the first end portion **35** thereof. The second end portion **36** of the assisting member **30** is located at the left side of the spring member **10**. The first and second mounting holes **121**, **221** of the first and second locking legs **12**, **20** firmly receive the first and second catches **51**, **52** of the retention frame **50** therein, whereby the heat sink **60** is maintained in intimate thermal contact with the CPU **70** for dissipating heat generated by the CPU **70**.

When the heat sink clip **1** is disassembled, the handle portion **42** of the actuating member **40** is operated in a counterclockwise direction whereby the heat sink clip is released.

It is to be understood, however, that even though numerous characteristics and advantages of the present invention have been set forth in the foregoing description, together with details of the structure and function of the invention, the disclosure is illustrative only, and changes may be made in detail, especially in matters of shape, size, and arrangement of parts within the principles of the invention to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.

What is claimed is:

1. A heat sink clip comprising:

a spring member including an elongated main body, a connecting portion formed at one end of the main body and a first locking leg extending from another end thereof;

a second locking leg coupled to the connecting portion of the spring member;

an actuating member connecting pivotally with the second locking leg; and

an assisting member located between the actuating member and the connecting portion, including a wedged main body operatively engaged with the actuating member, the wedged main body having a lower end and a higher end, wherein when the actuating member is rotated from a first orientation to a second orientation, the actuating member is motivated by the wedged main body to move from the lower end thereof to the higher end thereof.

2. The heat sink clip of claim **1**, wherein the main body of the spring member includes a V-shaped pressing portion at a middle portion thereof.

3. The heat sink clip of claim **1**, wherein the actuating member has one end thereof terminating in a rotating portion defining a plurality of first teeth thereon, and a plurality of second teeth are formed on an inclined top surface of the

wedged main body of the assisting member, corresponding to and engaging with said first teeth.

4. The heat sink clip of claim **3**, wherein the spring member has a pair of connecting plates extending from the connecting portion, at least one of the connecting plates defines an elongated slot therein, and the connecting portion defines a first slot therethrough, the first slot of the connecting portion being located between the connecting plates, the wedged main body of the assisting member and the rotating portion of the actuating member being received between the connecting plates.

5. The heat sink clip of claim **4**, wherein the first locking leg is monolithic with the main body of the spring member, the second locking leg has a top end extending through the first slot of the connecting portion and projects above the connecting portion.

6. The heat sink clip of claim **5**, wherein the wedged main body of the assisting member defines a second slot therethrough, and the rotating portion defines a third slot therein, wherein the top end of the second locking leg which projects above the connecting portion passes through the second slot of the assisting member and enters into the third slot of the actuating member.

7. The heat sink clip of claim **5**, wherein the top end of second locking leg defines a first though hole therein, the rotating portion of the actuating member defines a second through hole therein, and a pin extends successively through the elongated slot of the at least one connecting plate, said second through hole and said first through hole to pivotally secure the second locking leg to the rotating portion of the actuating member.

8. The heat sink clip of claim **4**, wherein at least a protrusion extends from each of two ends of the wedged main body of the assisting member, the protrusion being engageable with the connecting plates to prevent the assisting member from separating from the connecting portion of the spring member.

9. The heat sink clip of claim **1**, wherein the assisting member and the actuating member are made of plastic material.

10. A heat dissipation assembly comprising:

a retention frame having a first engaging unit at each of a pair of opposite sides thereof;

a heat sink seated adjacent to the retention frame; and

a clip for securing the heat sink to the retention frame, comprising:

a spring member including a main body, a first locking leg extending downwardly from one end of main body;

a second locking leg connected to another end of the main body, the first and second locking legs each having a second engaging unit thereon;

an actuating member connecting pivotally with the second locking leg; and

an assisting member having a main body engaged with the actuating member, the main body of the assisting member including a lower section and a higher section, the assisting member being moveable between a first position at which said actuating member engages with said lower section and a second position at which said actuating member engages with said higher section, wherein when the assisting member moves from said first position to said second position, said second engaging units of the first and second locking legs are brought into engagement with the first engaging units of the retention frame.

11. The heat dissipation assembly of claim **10**, wherein the first engaging unit is a catch while the second engaging unit is a mounting hole.

12. The heat dissipation assembly of claim **10**, wherein the actuating member has one end thereof terminating in a rotating portion defining a plurality of first teeth thereon, and a plurality of second teeth corresponding to and engaging with the first teeth are formed on the main body of the assisting member from said lower to said higher section of the main body of the assisting member.

13. The heat dissipation assembly of claim **12**, wherein a connecting portion is formed at the another end of the main body of the spring member, and a pair of spaced connecting plates extend upwardly from the connecting portion and at least one of the connecting plates defines an elongated slot therein, and the connecting portion defines a first slot therethrough between the connecting plates.

14. The heat dissipation assembly of claim **13**, wherein a top end of the second locking leg passes through the first slot and projects above the connecting portion.

15. The heat dissipation assembly of claim **14**, wherein the main body of the assisting member is wedge-shaped and defines a second slot therethrough, and the rotating portion defines a third slot therein, wherein the top end of the second locking leg which projects above the connecting portion passes through the second slot of the assisting member and enters into the third slot of the actuating member.

16. The heat dissipation assembly of claim **10**, wherein the assisting member has a linear, horizontal movement when the assisting member moves from said first position to said second position.

17. A heat sink assembly comprising:

a heat sink defining a groove therein; and

a heat sink clip received in the groove and comprising:

an elongated body having an end;

an assisting member positioned on the end of the elongated body, defining a plurality of first teeth thereon extending from a first end portion to a second end portion of the assisting member, wherein the first end portion is lower than the second end portion;

an actuating member having a round end with a plurality of second teeth formed thereon, the second teeth engaging with the first teeth; and

a locking leg having an upper end extending upwardly through the end of the elongated body and the assisting member to pivotably connect with the actuating member;

wherein when the actuating member is rotated from a first orientation to a second orientation, the actuating member is motivated to move from the first end portion to the second end portion of the assisting member.

18. The heat sink assembly of claim **17**, wherein the assisting member is horizontally movably positioned on the end of the elongated body of the clip.

19. The heat sink assembly of claim **18**, wherein the end of the elongated body forms two connecting plates, the actuating member and the locating member being received between the two connecting plates, each of the connecting plates having a vertically elongated slot therein, a pin extending through the elongated slots, the upper end of the locking leg and the round end of the actuating member to thereby pivotally secure the locking leg and the actuating member to the connecting plates.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 7,604,041 B2
APPLICATION NO. : 11/309378
DATED : October 20, 2009
INVENTOR(S) : Yu et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

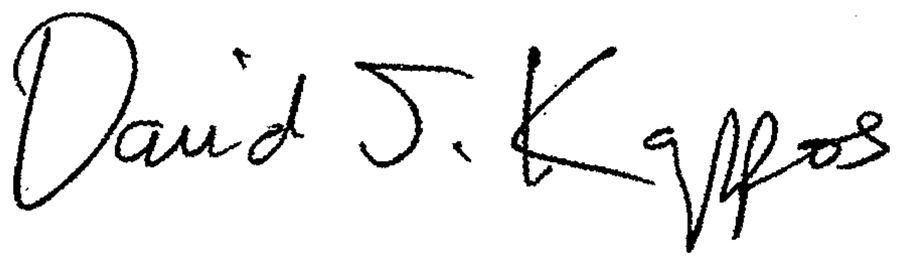
On the Title Page:

The first or sole Notice should read --

Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 611 days.

Signed and Sealed this

Fifth Day of October, 2010



David J. Kappos
Director of the United States Patent and Trademark Office